Proposal for Establishing the National Institute for Green and Advanced Agriculture in Xiong' an New Area (Postprint)

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Abstract

As China continues its north-to-south grain (and livestock) transportation, the densely populated and land-scarce south has become the country' s industrially developed region, while the vast and sparsely populated north is emerging as the advantageous and potential zone for agricultural development. As a major strategic decision by the Party Central Committee to advance the coordinated development of the Beijing-Tianjin-Hebei region, Hebei Xiong' an New Area, in order to fulfill its development orientation as a green, ecological, and livable new city, necessitates the establishment of a National Green Advanced Agriculture Research Institute. In September 2017, the Central Committee issued the 'Opinions on Innovating Systems and Mechanisms to Promote Green Agricultural Development' ; the report of the 19th CPC National Congress stated that the modernization we pursue is one of harmonious coexistence between humanity and nature; the Chinese Academy of Sciences has also long championed and advanced green agricultural development. Therefore, establishing the National Green Advanced Agriculture Research Institute would enable research into global trends in advanced agricultural science and technology, innovation in advanced agricultural technologies and theories, and creation of green advanced agricultural models, thereby leading China to become a world leader in agricultural science and technology innovation. By integrating modern urban technological civilization with ecological agricultural models, forming spatial patterns, industrial structures, production modes, and lifestyles that conserve resources and protect the environment, a picturesque, harmonious, and beautiful ecological environment in Xiong' an New Area can be created. Strengthening the 'Belt and Road' agricultural 'going global' strategy will not only unite countries worldwide geopolitically, but also establish a globally integrated cooperative and win-win relationship in economy and food security, thereby making important contributions to global food security, poverty alleviation, and green, peaceful development.

Full Text

Suggestions to Establish National Advanced Green Agricultural Research Academy in Xiongan New Area

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Abstract

As China continues its long-term pattern of transporting grain and livestock from north to south, the southern regions—characterized by dense populations and limited arable land—have become the nation's industrial powerhouses, while the sparsely populated northern regions with vast farmland are emerging as advantageous and potential zones for agricultural development. The establishment of Hebei Xiongan New Area represents a major strategic decision by the Party Central Committee, with Comrade Xi Jinping at its core, to deepen the implementation of the Beijing-Tianjin-Hebei coordinated development strategy and to actively yet prudently relieve Beijing of non-capital functions. To fulfill Xiongan' s development positioning as a green, ecological, and livable new city, it is essential to establish a National Advanced Green Agricultural Research Academy in the area. In September 2017, the central government issued the "Opinions on Innovating Systems and Mechanisms to Promote Green Agricultural Development," while the 19th National Congress report emphasized that the modernization we seek is one of harmonious coexistence between humanity and nature. The Chinese Academy of Sciences (CAS) has long advocated for and promoted green agricultural development. Therefore, establishing this academy would enable China to study global trends in advanced agricultural science and technology, innovate advanced agricultural technologies and theories, and create green agricultural models, ultimately leading China to become a world leader in agricultural science and technology innovation. By integrating modern urban technological civilization with ecological agriculture models, Xiongan can develop spatial patterns, industrial structures, production methods, and lifestyles that conserve resources and protect the environment, creating a picturesque, harmonious, and beautiful ecological environment. Furthermore, strengthening the agricultural "going global" strategy under the Belt and Road Initiative will not only unite countries worldwide geopolitically but also establish globally integrated win-win cooperation in economic and food security terms, contributing significantly to global food security, poverty alleviation, and green, peaceful development.

Keywords: Xiongan New Area, national, green, advanced, agriculture, research academy

The establishment of Hebei Xiongan New Area represents a major strategic decision and historic engineering project—described as a "millennium plan"and a "na-

tional priority" —by the Party Central Committee, with Comrade Xi Jinping at its core, to advance the Beijing-Tianjin-Hebei coordinated development strategy and orderly relieve Beijing of non-capital functions. Its development positioning encompasses four key areas: an ecologically friendly and livable new urban district, a leading zone for innovation-driven development, a demonstration area for coordinated development, and a pioneering area for open development [1].

In September 2017, the General Office of the CPC Central Committee and the State Council issued the "Opinions on Innovating Systems and Mechanisms to Promote Green Agricultural Development," which established the following objectives: prioritize green agricultural development within the broader framework of ecological civilization construction; comprehensively establish a green-oriented institutional system; fundamentally form an agricultural development pattern that matches resource and environmental carrying capacity and coordinates with production, living, and ecological spaces; strive to ensure no reduction in cultivated land quantity, no decline in cultivated land quality, no over-extraction of groundwater, zero growth in chemical fertilizer and pesticide use, and full utilization of crop straw, livestock manure, and agricultural films; and achieve sustainable agricultural development, wealthier farmers, and more beautiful, livable rural areas. The plan also sets specific ecosystem stability targets: by 2020, national forest coverage should reach 23% or higher, wetland area should remain no less than 800 million mu, shelterbelt networks in basic farmland should achieve 95% coverage, and comprehensive grassland vegetation coverage should reach 56%; by 2030, ecosystems in farmland, grasslands, forests, wetlands, and water areas should further improve. Green supply capacity should also significantly increase: by 2020, national grain (cereal) comprehensive production capacity should stabilize above 550 million tons, with notable improvements in agricultural product quality, safety, and brand recognition, while leisure agriculture and rural tourism accelerate; by 2030, agricultural product supply should become more high-quality and safe, and agricultural ecological services should further improve [2].

Ensuring food security is an eternal imperative for China. With a population exceeding 1.375 billion, China ranks as the world' s most populous nation, which necessitates placing food security as the top priority. As General Secretary Xi Jinping has repeatedly emphasized, ensuring food security is an eternal subject [4]. With central government support, CAS established three agricultural modernization institutes in Northeast China, North China, and the middle-lower Yangtze Plain during the late 1970s to accelerate modern agricultural development in China' s three major grain-producing regions. However, by around 2000, these institutes were merged into other units due to social and technological development and institutional restructuring, leaving China without national or provincial-level agricultural modernization research institutes today. This gap has become a key constraint on China' s modernization, as relatively slow modern agricultural development hinders overall progress. Consequently, since 1982, 19 consecutive No. 1 Central Documents have focused on modern agricultural development, providing strong policy support. Over the past three decades,

China has achieved 13 consecutive years of grain production increases, ensuring national food security and providing powerful support for modernization. The 19th Party Congress report reaffirmed the importance of ensuring national food security and keeping Chinese people' s rice bowls firmly in their own hands [5].

The northern regions represent the potential area for China' s food security and sustainable agricultural development. Currently, China' s three staple grains —wheat (North China) and corn (North China, Northeast)—are primarily produced in the north, while rice production has also shifted from south to the Northeast Plain. Major oil crops including soybeans (Northeast, Huang-Huai region), peanuts (Huang-Huai region), and rapeseed (Northwest) are also mainly located in northern regions. Additionally, due to severe water system and ecological environment pollution from southern aquaculture, and abundant, inexpensive corn and soybean feed resources in the north, livestock farming (particularly pig farming) is shifting from south to north. The pattern of "northern grain (and livestock) transported south" will continue developing [3]. Consequently, while the south has become China' s industrial powerhouse due to its dense population and limited land, the north has emerged as an advantageous and potential zone for agricultural development due to its vast land and sparse population [6]. This makes establishing the National Advanced Green Agricultural Research Academy in Xiongan—a future innovation hub in northern China—a timely and strategic move to lead China toward becoming a global green agricultural science and technology innovation power.

Advanced agriculture represents the innovative hallmark and core of modern agriculture. While most definitions of modern agriculture encompass "modern science and technology," "modern material equipment," and "modern management"—with "modern"implicitly representing advancement—contemporary China exhibits simultaneous coexistence of advanced and backward agricultural production levels due to regional development imbalances. The essential distinction lies in the level of socio-economic and scientific-technological development. Replacing "modern agriculture" with "advanced agriculture" more clearly defines the scientific connotation of utilizing "advanced science and technology," "advanced material equipment," and "advanced management." Therefore, advanced agriculture constitutes the innovative symbol and core of modern agriculture [7].

Creating the Green Advanced Agricultural Research Academy represents an urgent need of our times. According to the central government' s overall strategic goal of building an innovative country and the "National Medium- and Long-Term Science and Technology Development Plan Outline (2006-2020)," and in response to CAS' s requirement for scientific and technological layout adjustment, the Shenzhen Institute of Advanced Technology (SIAT) was jointly established in February 2006 by CAS, the Shenzhen municipal government, and the Chinese University of Hong Kong. This institute comprises seven research platforms focused on enhancing independent innovation capabilities in advanced manufacturing and modern services in the Guangdong-Hong Kong region and

promoting the establishment of China's independent intellectual property-based new industries, with the goal of becoming an internationally first-class industrial research institute [8]. This successful model in southern China' s industrial powerhouse provides valuable experience for establishing a similar institute in northern China. Given China' s current push for green agricultural development and CAS' s strategic positioning to serve national modern agricultural development needs, establishing a Green Advanced Agricultural Research Academy in the North China Plain—China' s grain-producing heartland and economic-cultural-political center—by seizing the once-in-a-millennium opportunity of Xiongan' s establishment in the Beijing-Tianjin-Hebei coordinated development strategy, would provide strategic research and technological support for China' s future green advanced agricultural development and food security.

The Chinese Academy of Sciences has long advocated and promoted green agricultural development. China's modern revolutionary development can be clearly divided into three stages: the "Red Revolution" from the founding of the Communist Party of China in 1921 to the establishment of the People' s Republic in 1949; the "Black Revolution" representing industrial development from 1949 to around 2000 when China basically entered the primary stage of a moderately prosperous society; and the "Green Revolution" from 2000-2020 focused on building a resource-saving and environmentally friendly society. China achieved three major leaps within a century—from "Red Revolution" to "Black Revolution" to "Green Revolution" [12]. The "Green Revolution" signifies that China must pursue a low-carbon economic development path centered on clean and renewable energy, green manufacturing, and green agriculture, which will improve the ecological environment, ensure food safety, and ultimately achieve green sustainable development [12]. Green food was proposed around 1990 by Liu Lianfu and others from the Ministry of Agriculture' s Land Reclamation Department, and the concept of green agriculture was introduced in 2003 to improve the green food development system [13,14]. The CAS Agricultural Project Office has long supported green food and green agriculture development [15]. Former Vice Premier Hui Liangyu twice instructed strong support for green agriculture and green food development. Chinese scientists led by Academician Li Zhensheng proposed the strategic concept of a "Second Green Revolution," defining its goals as "less input, more output, and environmental protection" [16]. With strong support from former CAS President Lu Yongxiang, who was also Vice Chairman of the Standing Committee of the National People' s Congress, CAS established the CAS Green Agricultural Technology Integration and Development Center in 2009 to promote rapid green agricultural (food) development nationwide [17,18]. CAS President Bai Chunli noted that science and technology should be more people-oriented, with green, healthy, and intelligent directions leading technological innovation. Future technologies should prioritize ecological environmental protection and restoration, developing low-energy-consumption, high-efficiency green technologies and products. Focusing on molecular module design breeding, accelerated photosynthesis, and intelligent technology applications, green agriculture will create new agricultural biological varieties, increase agricultural

output and quality, and ensure grain and food safety [19]. The Food and Agriculture Organization (FAO) Asia-Pacific Regional Office has paid close attention to China' s green agriculture and green food development, hosting over ten conferences on the topic in China and other East Asian countries. For instance, the International Symposium on Sustainable Agricultural Development Models in the Asia-Pacific Region was held in Hangzhou, Zhejiang on April 26-27, 2011, with representatives from 11 APEC economies and the FAO Asia-Pacific Regional Office conducting in-depth discussions on green food, green agriculture, organic agriculture, ecological agriculture, circular agriculture, modern agriculture, and sustainable development, aiming to promote the international development of China' s green agriculture (food) [20].

Green agriculture is a complex systematic engineering project whose core is producing green food while simultaneously achieving green development of the ecological environment, green economy, harmonious development, and sustainable development. This requires comprehensive participation and coordinated management across all systems and the entire industrial chain, including industry, agriculture, food industry, and distribution. The design and supervision of food safety production should follow the green industry chain framework [Figure 1: see original paper], comprising four major components: safety indicator systems for green agricultural base construction, safety indicator systems for green agricultural input materials, safety indicator systems for green agricultural (food) production (including all aspects of processing and sales), and green agricultural economic indicator systems. Following the approach shown in Figure 2 [Figure 2: see original paper], China should further establish and improve its green agriculture and green food production technology standard systems [22,23].

Specific Proposals for Establishing the National Green Advanced Agricultural Research Academy in Xiongan New Area

Xiongan New Area remains primarily a traditional agricultural region with weak industrial foundations and low urbanization levels, thus possessing ample development space and basic conditions for high-standard development. CAS holds natural advantages in integrating research teams across ecological resource zoning, modern agriculture, and information automation, enabling it to design scientific solutions in the short term that optimize the integration of ecological agriculture and smart cities for Xiongan and the Beijing-Tianjin-Hebei region. Currently, Xiongan lacks distinctive agricultural achievements, and although it has Baiyangdian Lake, it is not a major aquatic production area. According to Xiongan' s development needs, constructing a high-standard green advanced agricultural park requires more than simple environmental greening with forests and grasslands or specialized zone development. Instead, it necessitates comprehensive consideration and mosaic design integrating urban agriculture, green agriculture, advanced agriculture, and technology demonstration parks. Models such as vertical space soilless clean cultivation using LED lighting, leisure and

health-oriented urban agriculture, and functional agriculture should be developed to efficiently recycle agricultural and other biological resources. Urban agriculture should utilize fruit trees, vegetables, spice crops, and flowers as landscaping plants, allowing urban residents to enjoy seasonal flowers and fruits rather than suffering from allergenic poplar and willow catkins, while satisfying nearby needs for leisure, sightseeing, and integrated health care. This approach would create a picturesque garden city and modern ecological civilization living zone. By combining modern urban technological civilization with ecological agriculture models, Xiongan can form spatial patterns, industrial structures, production methods, and lifestyles that conserve resources and protect the environment, creating a poetic, harmonious, and beautiful ecological environment.

The National Green Advanced Agricultural Research Academy should focus on three main tasks: (1) providing advanced agricultural technology and environmental protection services for Xiongan's high-level construction; (2) establishing a world-class, high-level advanced agricultural research institute as a demonstration model for developing regions and countries; and (3) serving as a national-level advanced agricultural research institute that initially focuses on creating green advanced agricultural technologies and models, then evolves to lead global advanced agricultural science and technology trends.

The academy' s research should concentrate on six directions: (1) global advanced agricultural science and technology and development model research; (2) research on optimizing models for China' s regional resources and agricultural development potential; (3) research on facility-based, factory-based, and urban agriculture; (4) research on green, functional, and nutritious agriculture; (5) research on healthy and leisure-oriented agriculture; and (6) research on sustainable agriculture with efficient resource recycling.

The academy's primary functions should include: (1) researching global trends in advanced agricultural science and technology; (2) innovating advanced agricultural technologies and theories; (3) creating green advanced agricultural models; (4) leading new trends in world agriculture; and (5) implementing the national Belt and Road strategy by researching global regional agricultural development potential and assisting other developing countries in advancing their agriculture—thereby establishing not only geopolitical unity with nations worldwide but also globally integrated win-win cooperation in economic and food security terms.

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Note: Figure translations are in progress. See original paper for figures.